

COMPOSITE GIRDER DEFLECTION

The attached sheet illustrates the method to be used for showing camber diagrams for steel girders.

The purpose of the web camber "WC" is to make the top of girder web parallel to the roadway surface. This results in a uniform depth of fillet, except for fabrication tolerances, and makes for simplification of deck forms.

The header camber "HC" is the amount the girder will deflect due to weight of deck slab, curb, railing, AC surfacing, and due to the effect of deck shrinkage. This is the amount the header grades must be raised above theoretical finished deck surface.

Discussion of the various components making up the web camber and the header camber follows:

1. Deck Dead Load

This is the deflection due to the weight of the deck slab. Moment of inertia for deflection calculations is for the steel girder only, before composite action develops.

2. Curb + Railing + AC

This is the deflection which occurs from placing the curb, railing, and the asphalt concrete surfacing. Moment of inertia is for the composite section with $n = 30$.

3. Deck Shrinkage

Simple span composite girders will continue to deflect after the deck concrete has set. Studies indicate this is the result of concrete shrinkage. The following formula is to be used to compute the ultimate deflection which results from this deck shrinkage:

$$\Delta = \frac{.00002 L^2}{Y_{ts}}$$

Where Δ = centerline span deflection in feet

L = girder span length in feet

Y_{ts} = distance in feet from C.G. of steel girder section only to top flange at centerline of span

Present data indicate that shrinkage deflection occurs within two to four months after the deck pour. The coefficient may be revised or modified in the future as more data are accumulated.

STRUDL may be used to calculate deck shrinkage deflections on simple or continuous structures.

Supersedes Memo to Designers 16-3 dated October 2, 1972

4. Girder Dead Load

This is the deflection due to the weight of girder, diaphragms and cross frames. Moment of inertia is for steel section only.

5. Vertical Curve

This will correct for vertical curve on the structure. It should be listed as plus or minus, depending on whether the curve is summit or sag.

6. Straight Girders on Curved Alignment

For structures having a horizontal curve the profile grade line is parallel with the curve, but the girder is a chord between bents. Therefore, the roadway surface along the top of girder will not be parallel to the theoretical profile grade along the curve. This correction is equal to the cross slope or superelevation times the mid-ordinate for the span. The correction for this is negative and shall be included in the computed web camber so that the fillet thickness will remain constant.

7. Additional Camber

The general policy will be to call for the girder web to be cambered so that it will be parallel to the roadway surface. Structures constructed on a sag vertical curve may therefore have girder webs with a negative camber.

An exception to this policy is the overcrossing with a sharp horizontal curve. For this case the depth of fillet at the supports shall be increased so that the deflected girder will not appear to be sagging. The correction for this is to be shown as Additional Camber.

To calculate dimension "Y" (the dimension from top of deck slab to top of girder web) see page 11-30 in *Bridge Design Details* manual.

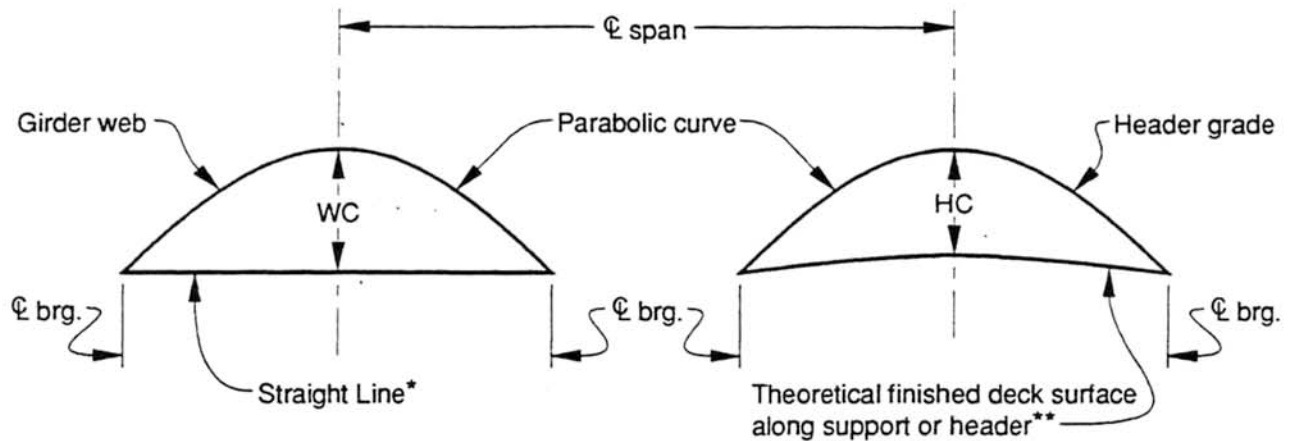


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Attachment



* Show curve above or below straight line as for particular structure.

** Show curved up or down as for particular structure

Web Camber Diagram

Fabricate girder web to curve shown. See table for values.

Support or Header Camber Diagram

Adjust support or header grades to curve shown. See table for values.

Span Camber Components	Span No.	
	Girders A & D	Girders B & C
1 ~ Deck Dead Load (+)		
2 ~ Curb + Rail + AC (+)		
3 ~ Deck Shrinkage (+)		
4 ~ Girder Dead Load (+)		
5 ~ Vertical Curve (\pm)		
6 ~ Horizontal Curve (-)		
7 ~ Additional Camber (+)		
HC = sum of 1 + 2 + 3 =		
WC = sum of 1 thru 7 =		

Note: Support or Header elevations will be determined by the Engineer.